INTERNATIONAL STANDARD ISO 13590(E)

Small craft — Personal watercraft — Construchon and system installation requirements

1 Scope

This International Standard applies to personal watercraft as defined in 3.1, for construction and installation of permanently installed petrol fuel systems, electrical systems, ventilation, and floatation.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1402:1984, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 7840:1994, *Small craft — Fire-resistant fuel hoses*

ISO 8469:1994, *Small craft — Non-fire-resistant fuel hoses*

ASTM D 380, *Methods of Testing Rubber Hose*

ASTM D 413, *Test Method for Rubber Property — Adhesion to Flexible Substrate'*

ASTM D 471, *Test Method for Rubber Property — Effect of liquids*

ASTM D 573, *Test Method for Rubber: Deterioration in an Air Oven*

ASTM D 1621, *Compressive Strength of Rigid Cellular Plastics*

ASTM D 2842, *Test Method for Water Absorption of Ridged Cellular Plastics*

SAE J378b, *Marine Engine Wiring*

SAE J1127, Battery *Cable*

SAE J1128, *Low Tension Primary Cable*

SAE J1527, *Marine Fuel Hoses*

SAE J2031, *High Tension Ignition Cab/e*

3 Definitions

3.1 personal watercraft: Vessel less than 4 m in length, which uses an internal combustion engine powering a water jet pump as its primary source of propulsion, and is designed to be operated by a person or persons sitting, standing, or kneeling on, rather than within, the confines of a hull.

3.2 fuel system: Entire assembly of the fuel fill, vent, tank and distribution components, including and not limited to pumps, valves, strainers, carburettors and filters.

3.3 static floating position: Attitude in which a personal watercraft floats in calm water, with each fuel tank filled to its rated capacity, but with no person or items of portable equipment on board.

3.4 conduit: Any type of rigid plastic or metal piping or tubing which supports the conductors contained within.

3.5 AWG: American Wire Gauge.

3.6 ignition protection: Design and construction of a device such that under design operation conditions; it will not ignite a flammable hydrocarbon mixture surrounding the device when an ignition source causes an internal explosion, or it is incapable of releasing sufficient electrical or thermal energy to ignite a hydrocarbon mixture, or the source of ignition is hermetically sealed.

3.7 sheath: Material used as a continuous protective covering, such as electrical tape, moulded rubber, moulded plastic, or flexible tubing, around one or more insulated conductors.

3.8 open to the atmosphere: Space or compartment that has at least 0,34 m^2 of open area directly exposed to the atmosphere for each cubic metre of net compartment volume.

3.9 ventilation: Changing of air within a compartment by natural means.

NOTE 1 Ventilation may be affected by dilution of contaminated air by introduction of fresh air, or by local exhaust of contaminated air.

3.10 engine compartment: Space where the engine is permanently installed.

3.11 bilge: Area in the personal watercraft below a height of 100 mm measured **from** the lowest point in the personal watercraft, where liquid can collect when the perrsonal watercraft is in its static floating position except engine rooms.

3.12 engine-compartment bilge: Space in the engine compartment or a connected compartment below a height of 300 mm measured from the lowest point where liquid can collect when the personal watercraft if in its static floating position.

4 Fuel system

4.1 General

4.1.1 Each fuel system fitting, joint, and connection shall be arranged so that it can be reached for inspection, removal or maintenance without removal of permanent boat structure.

4.1.2 The fuel system shall be designed not to leak liquid fuel into the watercraft when

- the personal watercraft is overturned through 180° of roll in either direction, and
- the personal watercraft is overturned through 90° of pitch in either direction.

4.1.3 The fuel system shall be designed not to leak liquid fuel into the personal watercraft when subjected to 20 kPa or 90 % design relief pressure of the system, whichever is greater.

4.1.4 The fuel system shall be designed to automatically stop the supply of fuel to the engine when the engine is not running.

4.2 Fuel tanks

4.2.1 Fuel tank prohibited materials

4.2.1.1 A fuel tank shall not be constructed of terneplate.

4.2.1.2 Unless it has an inorganic sacrificial galvanic coating on the inside and outside of the tank, a fuel tank shall not be constructed of black iron or steel.

4.2.1.3 A fuel tank encased in cellular plastic or in fiber reinforced plastic shall not be constructed from a ferrous alloy.

4.2.2 Cellular plastic used to encase fuel tank

4.2.2.1 Cellular plastic'used to encase fuel tanks shall not change volume by more than 5 % or dissolve after being immersed in any of the following liquids for 24 h at 29 °C:

- Reference fuel B of ASTM D 471 or equivalent fuel;
- No. 2 reference oil of ASTM D 471 or equivalent fuel;
- 5 % solution of trisodium phosphate in water.

4.2.2.2 Cellular plastic used to encase fuel tanks shall not absorb more than 60 g of water per 0,1 m^2 of cut surface.

4.2.2.3 Non-polyurethane cellular plastic used to encase metallic fuel tanks shall have a compressive strength of at least 400 kPa at 10 % deflection, when determined in accordance with ASTM D 1621.

4.2.2.4 Polyurethane cellular plastic used to encase metallic fuel tanks shall have a density of at least 0,032 g/cm?

4.2.3 Fuel level indication

A means shall be provided to check the fuel level or a reserve fuel supply shall be provided.

4.2.4 Tank pressure limitation

With the personal watercraft in its static floating position, a fuel tank when filled shall have an air expansion volume or be equipped with a system that prevents pressure in the tank from exceeding 80 % fuel tank design pressure.

4.2.5 Fill and vent openings

Fill and vent openings shall be at or above the liquid level when the tank is filled to capacity in its static floating position.

4.2.6 Fuel tank static pressure test
A representative fuel tank shall not leak if tested using the following procedures.

4.2.6.1 Fill the tank with air or inert gas to 20 kPa or 90 % of the design relief pressure, whichever is greater.

4.2.6.2 Examine each tank fitting and seam for leaks using a leak detection method other than the pressure drop method.

4.2.7 Fuel tank shock test
A representative fuel tank shall not leak when tested using the following procedure.

4.2.7.1 Confirm that the tank does not leak when pressure tested according to 4.2.6.

4.2.7.2 If the tank is nonmetallic, precondition the tank by filling it to capacity with petrol that has at least a 50 % aromatic content. Keep the fuel in the tank at 21 °C or higher for at least 30 days prior to testing.

4.2.7.3 Mount the empty tank on the platform of an impact test machine in a manner similar to the manner in which the tank and hold-down arrangement is installed in the personal watercraft.

4.2.7.4 Fill the tank to capacity with water.

4.2.7.5 Apply 1000 cycles of vertical accelerations 25 g at a rate of 80 cycles or less per minute. Apply the accelerations within 76 mm of the center of the horizontal mounting surface of the tank. The duration of each vertical acceleration pulse measured at the base of the shock envelope shall be between 6 and 14 ms.

4.2.7.6 Check the tank for leaks using the procedure specified in 4.2.6.

4.3 Fuel tank **installations**

4.3.1 Non-encased fuel tanks

4.3.1.1 Each fuel tank shall not support a deck, bulkhead, or other structural component.

4.3.1.2 Fuel tanks shall not be integral with the hull or engine.

4.3.1.3 Each metallic fuel tank as installed shall allow water to drain from the top surface when the personal watercraft is in its static floating position.

4.3.1.4 Each fuel tank support, chock, or strap that is not integral with a metallic fuel tank shall be insulated from the tank surface by a material that does not absorb moisture.

4.3.1.5 Cellular plastic shall not be the sole support for a metallic fuel tank.

4.3.2 Plastic encased fuel tanks

4.3.2.1 Each fuel tank encased in cellular plastic foam or in fiber reinforced plastic shall have the connection and fittings accessible for inspection and maintenance.

4.3.2.2 If a metallic fuel tank is encased in cellular plastic or in fiber reinforced plastic, water shall not collect between the plastic and the surface of the tank or be held against the tank by capillary action.

4.3.2.3 If the plastic is bonded to the surface of a metallic fuel tank, the adhesive strength of the metal to

the plastic bond shall exceed the cohesive strength of the plastic.

4.4 Fuel tank fill system

4.4.1 Each fuel fill opening shall be located so that when the personal watercraft is in its static floating position, a petrol overflow of up to 19 l/min for at least 5 s will not enter the personal watercraft.

4.4.2 Each hose in the tank fill system shall be secured to a pipe, spud, or hose fitting by a method that prevents leaks and prevents the hose from becoming disconnected.

4.5 Fuel pumps

4.5.1 Each diaphragm fuel pump shall not leak fuel into the personal watercraft if the primary diaphragm fails.

4.5.2 Each electrically operated fuel pump shall not operate except when the engine is operating or when the engine is being started.

4.6 Carburettors

Each carburettor shall not leak externally more than 5 cm^3 of fuel in 30 s when:

- the float valve is open (if applicable);
- the carburettor is at half throttle;
- the engine is cranked without starting or the fuel pump is delivering the maximum pressure specified by its manufacturer (if applicable).

4.7 Fuel stop valves

Each electrically operated fuel stop valve in a fuel line between the fuel tank and the engine shall open electrically only when the ignition switch is on.

4.8 Fuel filters and strainers

Each fuel filter and strainer shall be supported on the engine or boat structure independent from its fuel line connections, unless the fuel filter or strainer is inside a fuel system component.

4.9 Spud, pipe and hose fitting

Except when used for a tank fill line, each spud, pipe, or hose fitting used with hose clamps shall have a bead, flare or a series of annular grooves or serration no less than 0,4 mm in depth.

4.10 Clips, straps and hose clamps

4.10.1 Each clip, strap, and hose clamp shall be of a corrosion resistant material and not cut or abrade the fuel line.

4.10.2 Hose clamps, when used, shall be used with hose designed for clamps.

4.10.3 Hose clamps, when used, shall be beyond the bead or flare, or over the serration of the mating spud, pipe, or hose fitting.

4.11 Metallic fuel line

4.11.1 Each metallic fuel line connecting the fuel tank with the fuel inlet connection on the engine shall not be made of carbon steel. Except for corrugated flexible fuel line, each metallic fuel line shall have a minimum wall thickness of 0,74 mm.

4.11.2 Each metallic fuel line that is mounted to the watercraft structure shall be connected to the engine by a flexible fuel line and shall be attached to the personal watercraft's structure within 100 mm of its connections to a flexible fuel line.

4.12 Plugs and fittings

A fuel system shall not have a fitting for draining fuel.

Exception: A plug used to remove fuel and/or water within the fuel filter or strainer shall have a tapered pipe thread or be a screw type fitting with a locking device other than a split lock washer.

4.13 Vent and fuel distribution hoses and connections

4.13.1 Each hose shall meet the requirements of 4.16.

4.13.2 Each hose shall be secured by a method that prevents leaks and prevents the hose from becoming disconnected.-

4.14 Grounding

Each metallic component of the fuel fill system and fuel tank that is in contact with fuel shall be statically grounded so that resistance between the ground and each metallic component of the fuel fill system and the fuel tank is less than 100 Ω.

4.15 Fire test

The fuel system in a representative personal watercraft equipped with its complete engine and fuel system shall not leak when tested using the following procedure.

4.15.1 Fill the fuel tank to one-fourth total capacity.

4.15.2 Close all bilge drains that might allow the fuel to flow out of the engine compartment.

4.15.3 Confirm fuel system meets the requirements of 4.1.3.

4.15.4 Pour an amount of heptane over the engine sufficient to burn at least 2,5 minutes, but no longer than 5 minutes.

4.15.5 Ignite the heptane.

4.15.6 Observe burning heptane after ignition.

4.15.7 Close engine compartment

4.15.8 Wait 2 minutes and 30 seconds.

4.15.9 Open engine compartment and exttnguish any remaining flame with carbon dioxide (CO_2).

4.15.10 Pressurize the fuel system to 2 kPa with air or inert gas and check for leaks.

4.16 Fuel hose specifications

The fuel hose shall either meet the performance specifications in ISO 7840 or ISO 8469, or meet the following hose specifications, which apply to two types of fuel hose for personal watercraft. One type is a reinforced hose with a cover and the other is a hose without a cover.

4.16.1 Tensile strength and elongation

Test for tensile strength and elongation shall be made, and specimens shall meet the conditions of table 1.

Table 1 — Tensile strength and elongation

Specification	Hose with cover Tube material	Hose with cover Cover material	Hose without cover Hose material
Original strength	8,0 MPa	7,0 MPa	8,0 MPa
Original elongation	200 % minimum	200 % minimum	200 % minimum

4.16.2 Dry heat resistance

After heat aging per ASTM D 573 for 70 h at 100 °C ± 2 °C specimens taken from the hose shall not have a reduction in tensile strength of more than 20 % or a reduction in elongation of more than 50 %.

4.16.3 Ozone resistance

Test procedure, apparatus, and acceptance level shall be according to ISO 7326, Method 1. This test applies to the outer surface of the hose only and cracks in the inner surface or cut edges shall be ignored.

4.16.4 Oil resistance

After 70 h immersion at 100 'C ± 2 °C in ASTM Oil No. 3 per ASTM D 471, specimens taken from the hose shall meet the conditions of table 2.

Table 2 — Oil resistance

Specification	Hose with cover Tube material	Hose with cover Cover material	Hose without cover Hose material
Reduction in Tensile strength	Not more than 40 %		Not more than 40 %
Reduction in elongation	Not more than 40 %		Not more than 40 %
Volumetric charge	- 5 % to + 25 %	0 to + 100 %	- 5 % to + 25 %

4.16.5 Burst test

The minimum burst when tested according to ISO 1402 shall be 300 kPa.

4.16.6 Vacuum collapse test

A 1 m length of hose shall be held in a straight line, and no diameter shall decrease by more than 20 % during application of a vacuum of 67 kPa for a minimum of 15 s and not more than 60 s. The vacuum collapse test on preformed parts shaii be done on the finished part. This test does not apply to hoses over

25 mm nominal diameter

4.16.7 Cold flexibility

The test specimen shall be conditioned per ASTM D 380 at -20 °C ± 2 °C for 5 h and then flex in the cold chamber through 180° from the centreline to a diameter of ten times the maximum OD of the hose. The flexing shall take place within 4 s and the hose shall not fracture or show any cracks or breaks, or a proof pressure of 0,7 MPa shall be applied to determine hose damage. The test method of a hose of a nominal diameter over 19 mm may be in accordance with the test method of SAE J1527 Style R1 using cutout specimens (100 x 6 mm).

4.16.8 Adhesion test (reinforced hose with cover)

The minimum load required to separate a 25 mm width of tube and cover at 23 °C ± 2 °C per ASTM D 413 shall be 27 N.

4.16.9 Fuel resistance

4.16.9.1 After 48 h immersion at 23 °C ± 2 °C per ISO 1817 in liquid C, physical values of specimens taken from the hose shall not exceed the change in values listed in table 3.

Table 3 — Fuel resistance

Change	Values
Tensile change	**- 45 %**
Elongation change .	**- 45 %**
Volume change	0 to + 50 %

4.16.9.2 Permeation shall be tested according to ISO 1817, Annex **A** and shall not exceed 300 g/m^2 24 h.

5 Electrical system

5.1 Conductor type, size and identification

5.1.1 Each conductor shall be insulated, stranded copper.

5.1.2 Conductors shall comply with SAE J378b, SAE J1127, SAE J1128, or equivalent standards.

5.1.3 No conductor shall be used to carry an amperage greater than that specified in table 4 for its gauge. The ampacity of conductors in an engine compartment shall be corrected by the appropriate factor shown in table 4.

5.1.4 A means of identification shall be used to distinguish individual conductors.

5.1.5 Table 4 gives allowable continuous current ratings in amperes determined for 30 °C ambient temperature.

Table 4 — Conductor cross sectional area, allowable continuous current and stranding

Cross-sectional area mm²	Maximum current, im amperes, for single conductors at insulation temperature ratings						Minimum number of strands	
	60 °C	70 °C	85 °C to 90 °C	105 °C	125 °C	200 °C	Type 1 *)	Type 2 *)
0,75	8	10	12	16	20	25	16	
1	12	14	18	20	25	35	16	
1,5	16	18	21	25	30	40	19	26
2,5	20	25	30	35	40	45	19	41
4	30	35	40	45	50	55	19	65
6	40	45	50	60	70	75	19	105
10	60	65	70	90	100	120	19	168
16	80	90	100	130	150	170	37	266
25	110	120	140	170	185	200	49	420
35	140	160	185	210	225	240	127	665
50	180	210	230	270	300	325	127	1 064
70	220	265	285	330	360	375	127	1 323
95	260	310	330	390	410	430	259	1 666
120	300	360	400	450	480	520	418	2 107
150	350	380	430	475	520	560	418	2 107

*) Conductors with at least type 1 stranding shall be used for general craft wiring. Conductors with type 2 stranding shall be used for any wiring where frequent flexing is involved in use.

For conductors in engine compartments (60 °C ambient), the maximum current rating in table 4 shall be derated by the factors below:

Temperature rating of conductor insulation: °C	Multiply maximum current from table 4 by:
70	0,75
85 to 90	0,82
105	0,86
125	0,89
200	1

5.1.6 For information, the voltage drop Eat load, in volts, may be calculated by the following formula:

$$E = \frac{0{,}016\ 4 \times I \times L}{S}$$

where S is the conductor cross-sectional area, in square millimetres;

I is the load current, in amperes;

L is the length, in metres, of conductor from the positive power source to the electrical device and back to the negative source connection.

5.2 Conductor support and protection

5.2.1 Each conductor shall be installed so that it is protected from physical damage.

5.2.2 Except for the first 500 mm of battery cables, conductors shall be supported by clamps or straps not more than 400 mm apart unless the conductor(s) is contained in a conduit.

5.2.3 Clamps, straps, or conduits shall be designed to prevent damage to the conductor insulation.

5.2.4 Conductors connecting components that can move with relation to each other shall be protected from stress.

5.2.5 Conductors passing through bulkheads, junction boxes, or other rigid surfaces shall be bushed with conduit or grommets, or the conductor shall be protected by a sheath.

5.3 External ignition protection

A representative electrical system as installed in the personal watercraft, or in an enclosure simulating the personal watercraft, shall not ignite a propane gas and air mixture that is 4,25 % to 5,25 % propane gas by volume surrounding the electrical system when it is operated in the mode in which it draws its maximum current. The test voltage supply shall be adjusted to 120 % of the nominal system voltage except magneto ignition systems.

5.4 Overcurrent protection

5.4.1 Except for conductors from self-limiting generators or alternators, each ungrounded current carrying conductor shall be protected by a manual reset trip free circuit breaker or fuse. The fuse or breaker shall be within 180 mm of the origin of the conductor to be protected so long as the fuse or breaker is sized for the smallest conductor in the circuit.

Exception 1: If a conductor is continuously protected from physical damage by a sheath or enclosure between its terminal ends, the maximum distance to its protecting fuse or breaker may be increased to 500 mm from the power source measured along the conductor.

Exception 2: An ungrounded supply conductor starting at a storage battery shall have its breaker or fuse within 900 mm of the battery measured along the conductor (see figure 1).

5.4.2 The voltage rating of each circuit breaker or fuse shall not be less than the nominal voltage of the circuit it is protecting.

5.4.3 The current ratings of the circuit breaker or fuse shall not be more than 150 % of the value in table 4 for the conductor it is protecting including the correction factor if any part of the conductor is in an engine compartment.

5.4.4 Circuit breakers or fuses for non-self-limiting generators and alternators shall have a current rating not exceeding 120 % of the maximum rated output at 60 ‘C.

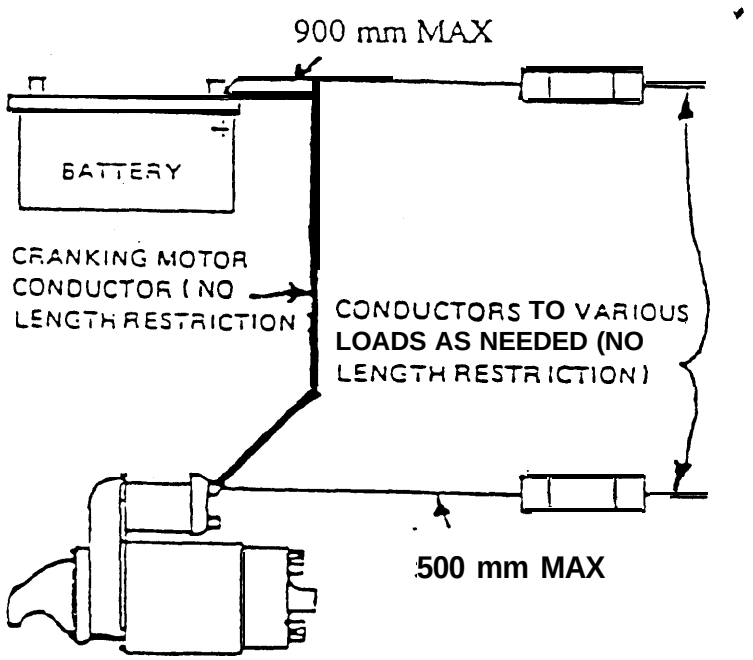

Figure 1 - Breaker/fuse location for an ungrounded-supply conductor starting at a storage battery

NOTE 2 Up to 500 mm max is allowed if the conductor, throughout this distance, is contained in a sheath of enclosure such as a junction box, **control** box, or enclosed panel.

5.5 Conductor terminations

5.5.1 All connections outside junction boxes or enclosures **shall** be made with closed ring, eyelet, captive spade, or mechanical or spring lock type connectors. Wire nuts shall not be used on any connection.

5.5.2 Single or multi-connector plugs outside junction boxes or enclosures shall not separate under an axial load of 25 N applied for 1 min.

5.53 A soldered joint shall not be the sole means of connection to any conductor except for battery terminal connectors with soldered joints at least **1,5** times longer than the diameter of the conductor strands.

5.5.4 Conductor splices and joints to connectors outside junction boxes or enclosures shall not break when subjected for **1** min to the load shown in table 5 for the smallest conductor in the connection.

5.5.5 Ungrounded terminal fittings and conductors shall be protected from accidental short **circuiting** with grounded metal or other ungrounded circuits in the event a termination should loosen. Continuously energized terminations without circuit protection shall be covered with boots or be equivalently protected.

Table 5 — Tensile test values for wire splices
(Conductor-conductor and conductor-connector joints)

Wire size mm (AWG)	Tensile force (N)
0,8 (18)	44
1 (16)	64
2 (14)	132
3 (12)	157
5 (10)	175
8 (8)	200
13 (6)	220
16 (5)	265
19 (4)	315
25 (3)	350
32 (2)	400
40 (1)	440

5.6 Batteries

5.6.1 Each installed battery shall not move more than 25 mm in any direction when a pulling force of twice the battery weight is applied through the centre of gravity of the battery as follows:

5.6.1.1 Vertically in both directions for a duration of 1 min.

5.6.1.2 Horizontally and parallel to the personal watercraft's centreline for a duration of **1** min fore and 1 min aft.

5.6.1.3 Horizontally and perpendicular to the personal watercraft's centreline for a duration of **1** min to starboard and 1 min to port.

5.6.2 Each battery shall be installed so that metallic objects cannot come in contact with the ungrounded battery terminals.

5.6.3 Each metallic fuel line and fuel system component within **100** mm and above the horizontal plane of the battery top surface as installed shall be shielded with dielectric material.

5.6.4 Each battery shall not be directly above or below a fuel tank, fuel filter, or fitting in **a** fuel line.

5.6.5 **A vent** system or other means shall be provided to allow the discharge from the personal watercraft of hydrogen gas released by the battery.

5.6.6 Each battery terminal connector shall not depend on **spring** tension for its mechanical connection to the terminal.

5.7 Secondary circuits of ignition systems

5.7.1 Each conductor in a secondary circuit of an ignition system shall meet the requirements in SAE J2031 or equivalent standards.

5.7.2 The connection of each ignition conductor to a spark plug, coil or distributor shall have a tight fitting cap, boot or nipple.

6 Ventilation

Personal watercraft shall have a ventilation system that meets the following requirements.

6.1 Ventilation means an airflow in a compartment in a personal watercraft achieved by having:

- a supply opening or duct from the atmosphere or from a ventilated compartment that is open to the atmosphere, and
- an exhaust opening into another ventilated compartment or an exhaust duct to the atmosphere.

6.2 Each exhaust opening or exhaust duct shall originate in the lower third of the compartment.

6.3 The two openings shall be separated by location either at the fore and aft sides of the engine compartment or on opposite sides of the personal watercraft.

6.4 Each supply and exhaust opening or duct in a compartment shall be above the normal accumulation of bilge water.

6.5 The minimum internal cross-section area of each supply and exhaust opening or duct shall exceed 20 cm^2.

7 Floatation test

This test is intended to provide manufacturers of personal watercraft with specific guidelines for determining the amount of floatation necessary to keep a portion of the personal watercraft above the surface of the water, after it has been swamped, and safely support each person it is rated to carry.

7.1 Test conditions

7.1.1 Each personal watercraft shall be loaded with its permanent appurtenances or with weight equivalent to its permanent appurtenances.

7.1.2 Fuel **and/or** oil tanks shall be full.

7.1.3 An additional iron weight of **10** kg shall be added for each person that **the** personal watercraft is rated to carry. The additional weight shall be secured to a portion of the watercraft that will be submerged during the test.

7.2 Test procedures

7.2.1 The personal watercraft shall be swamped, allowing calm, fresh water to flow between the inside and outside of the personal watercraft, either over the sides, through a hull opening, or both. Entrapped air in the flooded portion of the personal watercraft shall be eliminated.

7.2.2 If air chambers are used to provide floatation on the personal watercraft, water shall flood the two largest air chambers and all chambers integral with the hull.

7.3 Acceptance level

The watercraft shall have enough floatation to keep part of the personal watercraft above the surface of the water when it has been submerged for at least 18 h.

7.4 Ffoatation material

Floatation materials shall meet the requirements in 7.4.1 through 7.4.7 as listed in table 6 when used in the: engine-compartment bilge, engine compartment or bilge, unless located in a sealed compartment.

7.4.1 Vapour test

The floatation material shall not reduce in buoyant force more than 5 % after being immersed in a fully saturated petrol vapour atmosphere for 30 days at a minimum temperature of 38 'C.

7.4.2 24-hour petrol test

The f!oatation material shall not reduce in buoyant force more than 5 % after being immersed for 24 h at 23 °C ± 2 in reference fuel B of ASTM D 471 or equivalent fuel.

7.4.3 30-day petrol test

The floatation material shall not reduce in buoyant force more than 5 % after being immersed for 30 days at 23 ● C ± 2 in reference fuel B of ASTM D 471 or equivalent fuel.

7.4.4 24-hour oil test

The floatation material shall not reduce in buoyant force more than 5 % after being immersed for 24 h at 23 'C ± 2 in reference oil No. 2 of ASTM D 471 or equivalent fuel.

7.4.5 30-day oil test

The floatation material shall not reduce in buoyant force more than 5 % after being immersed for 30 days at 23 °C ± 2 in reference oil No. 2 of ASTM D 471 or equivalent fuel.

7.4.6 24-hour bilge cleaner test

The floatation material shall not reduce in buoyant force more than 5 % after being immersed for 24 h at 23 °C ± 2 in a 5 % solution of trisodium phosphate in water.

7.4.7 30-day bilge cleaner test

The floatation material shali not reduce in buoyant force more than 5 % after being immersed for 30 days at 23 °C ± 2 in a 5 % solution of trisodium phosphate in water.

NOTE 3 The buoyant force reduction in items 7.4.1 through 7.4.7 of this clause may be measured in accordance with ASTM D 2842.

Table 6 — Floatation performance tests

	Areas		
Tests	**Engine-compartment bilge (3.12)**	**Engine-compartment** unless **open to atmosphere (3.10)**	**Bilge (3.11)**
7.4.1 Vapour test		X	
7.4.2 24-hour Petrol Test			**X**
7.4.3 30-day Petrol Test	X		
7.4.4 24-hour Oil Test			**X**
7.4.5 30-day Oil Test	**X**		
7.4.6 24-hour Bilge Cleaner Test			**X**
7.4.7 30-day Bilge Cleaner Test	**X**		

Annex A
(informative)

Bibiibgraphy

NOTE 4 The following standards are not referred to in this Internatronal Standard, but have been taken into account in its preparation.

[1] ISO 3:1973, *Preferred numbers - Series of preferred numbers*

[2] ISO 1307:1983, *Rubber and plastics hoses - Bore diameters and tolerances on length*

[3] ISO 7233:1983, *Rubber and plastics hoses and hose assemblies - Vacuum resistance - Methods of test*

[4] ISO 10088:1992, *Small craft - Permanently installed fuel systems and fixed fuel tanks*

[5] ISO *10133:* 1994, *Small craft - Electrical systems - Extra -lo w-voltage d.c. installations*